

California MLPA Master Plan Science Advisory Team
Evaluation of the Round 3 MLPA North Coast Regional Stakeholder Group
MPA Proposal: Habitat Representation, Habitat Replication,
MPA Size and MPA Spacing Analyses
October 14, 2010

The Marine Life Protection Act (MLPA) Master Plan Science Advisory Team (SAT) evaluates marine protected area (MPA) proposals in relation to the goals of the MLPA. SAT evaluations of habitat representation and habitat replication primarily address goals 1 and 4 of the MLPA, which focus on ecosystems and habitats. SAT evaluations of MPA size and spacing between protected habitats primarily address goals 2 and 6 of the MLPA, which focus on marine life populations and connectivity. The MLPA North Coast Regional Stakeholder Group (NCRSG) worked together to develop a single MPA proposal during round three of the north coast MPA planning process. The discussion and associated figures and tables in this document compare the Round 3 NCRSG MPA Proposal (abbreviated NCP) and the 'no action' alternative (Proposal 0, labeled as "P0" in figures and tables) for each of the four evaluations listed above.

Methods for these analyses, including explanations of levels of protection (LOPs), are described in an associated document: *Draft Methods Used to Evaluate Marine Protected Area Proposals in the MLPA North Coast Study Region* (SAT Evaluation Methods Document).

The Round 3 NCRSG MPA Proposal includes a number of MPAs intended to accommodate non-commercial, traditional tribal activities, however, according to the State of California, under current statutory authority, exclusive rights cannot be granted to any one group. Therefore, any proposed non-commercial uses in MPAs must be open to all recreational users and may not be exclusive to members of tribes and tribal communities. The NCRSG identified MPAs within its Round 3 NCRSG MPA Proposal that were intended to accommodate tribal uses and requested that MLPA Initiative staff work with DFG to identify the species and gear types that are legally appropriate for each MPA, based on input from north coast tribes and tribal communities. If available, MLPA Initiative staff drew from the uses proposed by tribes and tribal communities that were specific to proposed MPAs. If no specific information was available for a proposed MPA (such as Reading Rock SMCA), then the general list of all proposed uses for the north coast study region (NCSR) was used.

All proposed MPAs intended to accommodate tribal activities received a "low" or "moderate-low" level of protection based on the broad suite of proposed non-commercial uses that would be open to all recreational users in those MPAs. (For more information about how levels of protection are assigned, see Chapter 3 of the SAT Evaluation Methods Document.) Proposed MPAs with LOPs below moderate-high are not included in the standard SAT evaluations of habitat replication, MPA size, and habitat spacing.

The MLPA Blue Ribbon Task Force (BRTF) requested that the SAT conduct a supplemental evaluation (abbreviated SUP in figures and tables) of the Round 3 NCRSG MPA Proposal. The supplemental evaluations for habitat representation, habitat replication, MPA size and habitat spacing consider:

- All MPAs at moderate-high level of protection and above.
- MPAs below moderate-high protection if the only proposed uses that reduced the LOP below moderate-high were those intended to accommodate tribal uses. If an MPA

received an LOP below moderate-high due to general commercial or recreational uses, the MPA was not included in the supplemental evaluation (e.g. Big River Estuary SMP).

A few MPAs are intended to accommodate tribal activities only when it becomes possible within the state of California statutory authority to limit allowed activities to tribes and tribal communities. The intention of the NCRSG, to be applied in the future when it becomes possible, is to accommodate exclusive tribal activities in these MPAs. Because these MPAs do not currently include proposed allowed uses to accommodate tribal activities, the assigned LOPs are not affected at this time. Proposed MPAs intended to accommodate tribal activities at some time in the future when exclusive uses become possible, include six state marine reserves (SMRs), one state marine conservation area (SMCA), and one state marine recreational management area (SMRMA).

Habitat Representation

Habitat abundance in the NCSR varies by habitat type and bioregion (Figure 1.1a). The most abundant open coast habitat in the study region is soft bottom at 30-100 meters (m) depth, which is also the most abundant habitat in each of the two bioregions where it encompasses over 200 square miles (sq mi) in each. Several rock and rock-associated habitats, including rocky shores, kelp, and rock 0-30m are more abundant in the southern bioregion, whereas soft bottom habitats are more abundant in the northern bioregion with the exception of deep soft bottom habitat (100-3000m). Deep rock (100-3000m) is rare in the study region, found only between Cape Mendocino and Shelter Cove, with just 0.38 square miles (sq mi) available in each bioregion. Canyon habitat also is rare in the study region, with 3.04 sq mi available in the northern bioregion and 4.54 sq mi available in the southern bioregion.

Estuarine habitats, including total estuary area, tidal flats, and coastal marsh are much more abundant in the northern bioregion (Figure 1.1b). Total estuary habitat available in the northern bioregion is 42.44 sq mi compared to a total of 1.05 sq mi in the southern bioregion. In particular, approximately two-thirds of the available estuarine habitat in the northern bioregion is found within Humboldt Bay (as indicated in Figure 1.1b). Humboldt Bay encompasses an area of 27.44 sq mi which is over six times greater than the next largest estuary in the study region, the Eel River estuary (4.24 sq mi). The other large estuaries (> 1.0 sq mi) in the study region also are all located in the northern bioregion (Lake Earl, Big Lagoon, Klamath River and Smith River), whereas the largest estuary in the southern bioregion is the Big River estuary (0.35 sq mi). Furthermore, most of the estuaries found in the southern bioregion are characterized by narrow channels and surrounded by steep sides, limiting the availability of coastal marsh, tidal flats, and eelgrass habitat.

The availability of eelgrass is much higher in the northern bioregion due to the large, dense eelgrass beds found in Humboldt Bay. Eelgrass is not comprehensively mapped across the study region, and high resolution mapping appropriate for assessing area is only available for Humboldt Bay (labeled as “mapped eelgrass” in figures and tables). Approximately 7.07 sq mi of mapped eelgrass is available in Humboldt Bay. MLPA Initiative staff also has confirmed eelgrass presence/absence for all major estuaries in the study region which allows the SAT to assess the proportion of known eelgrass locations protected (labeled as “all eelgrass locations” in figures and tables).

The availability of open coast habitat replicates (i.e. sufficient quantity of each open coast habitat to be included as a replicate in standard SAT evaluations of habitat replication and MPA spacing) by latitude throughout the NCSR can be found in Figure 1.2.

An overall summary of the NCRSG MPA Proposal by designation type and by LOP can be found in Figure 1.3.

Key Points from Proposal Summary Graphs Figure 1.3

- NCP includes six SMRs encompassing 5.0% of the study region.
- NCP includes seven SMCAs encompassing 8.0% of the study region. However, only one SMCA has an assigned LOP at moderate-high or above (Point St. George Reef Offshore SMCA). All other SMCAs include proposed recreational take open to all recreational users and intended to accommodate traditional tribal uses that reduce the LOP to moderate-low or low.
- The proportion of the study region area in MPAs at or above moderate-high protection, including SMRs and SMCAs, is 5.9%.
- No MPAs were proposed at high protection.

Key Points from Habitat Representation Analyses (Figures 2.1 – 2.6)

Rocky Habitats

- NCP protects a small proportion of available rock 0-30m habitat (less than 5%) and less than 10% of available rocky shores, offshore rocks, and kelp habitats in very high protection MPAs.
- NCP includes at least 20% of available rock 30-100m and rock 100-3000m habitats in very high protection MPAs (range 21-35%), although the deepest rock habitat is rare in the study region.
- NCP includes shoreline and nearshore rocky habitats (rocky shores, offshore rocks, kelp, and rock 0-30m) in two different types of MPAs, either SMRs or SMCAs with low protection due to recreational uses intended to accommodate tribal activities.
- At least 3% and up to 5% of available habitat for shoreline and nearshore rocky habitats (rocky shores, offshore rocks, kelp, and rock 0-30m) and offshore rocks habitat is included in MPAs with moderate-low or low protection due to recreational uses intended to accommodate tribal activities.
- At low and above protection (Supplemental Evaluation or SUP), NCP includes 8-12% of available shoreline and nearshore rocky habitats (rocky shores, offshore rocks, kelp, and rock 0-30m) in MPAs.
- At low and above protection (SUP), NCP includes 22-38% of available rock 30-100m and deep rock (100-3000m depth) in MPAs.

Soft-bottom Habitats

- NCP includes a small proportion of available beaches and soft 0-30m habitats in very high protection MPAs (2-3%), and a slightly larger proportion of soft 30-100m and soft 100-3000m habitats (6-7%) in very high protection MPAs.
- NCP includes approximately 20% of available canyon habitat in very high protection MPAs, although this habitat is rare in the study region.
- At moderate-high protection, NCP includes an additional 2-3% of available soft 30-100m and soft 100-3000m habitats.
- NCP includes shoreline and nearshore soft-bottom habitats (beaches and soft 0-30m) in two different types of MPAs, either SMRs or SMCAs with moderate-low or low protection due to recreational uses intended to accommodate tribal activities.
- At least 5% and up to 9% of available soft-bottom habitats are included in MPAs with moderate-low or low protection due to recreational uses intended to accommodate tribal activities.
- At low and above protection (SUP), NCP includes at least 10% and up to 29% of each soft-bottom habitat in MPAs.

Estuarine Habitats

- In the northern bioregion, NCP does not protect any estuarine habitats at very high protection.
- In the northern bioregion, at low and above protection (SUP), NCP does not protect any available tidal flat habitat, includes a small proportion of available estuary and coastal marsh habitat (1-2%), includes a small proportion of available mapped eelgrass habitat (3%), and captures one of four eelgrass locations.
- In the southern bioregion, at very high protection, NCP protects a large proportion (range 17-36%) of available habitat for three estuarine habitats (estuary, coastal marsh, and eelgrass locations), but does not include any proportion of tidal flats habitat.
- A substantial portion of available estuarine habitats in the southern bioregion, are included in MPAs that were assigned a low LOP due to a combination of general recreational uses and uses intended to accommodate tribal activities. These MPAs were not included in the supplemental evaluation (SUP) due to the fact that some general recreational uses proposed in these MPAs resulted in LOPs below moderate-high.
- At all protection levels (SUP), NCP includes less than 1% of available tidal flats habitat, 2-3% of available estuary, coastal marsh, and mapped eelgrass habitat, and 25% of known eelgrass locations across the study region.

Habitat Replication

The replication guideline in the *California Marine Life Protection Act Master Plan for Marine Protected Areas*, specifies that each habitat should be replicated in three to five SMRs in each biogeographical region (Point Conception to the California-Oregon border). This guideline has

already been met by existing MPAs from the central coast and north central coast study regions, however, for within-habitat ecosystem representation, monitoring and evaluation opportunities, the SAT has recommended that habitats are replicated in at least one MPA in each of the two bioregions of the NCSR. In order to be included in the replication analysis the MPA must meet the minimum size guideline (9 sq mi), and a given habitat within the MPA must be present in a sufficient amount to encompass 90% of associated biodiversity (see Chapter 5: Habitat Replication Analyses in the SAT Evaluation Methods Document for further details).

The results of the habitat replication analysis are displayed in figures 3.1 to 3.4. In figure 3.1, the number of open coast MPAs that contain a sufficient amount of each habitat to achieve a replicate are shown for each MPA proposal at very high (Figure 3.1a), moderate-high (Figure 3.1b), and low and above protection levels (SUP [Figure 3.1c]). MPAs below moderate-high LOP are included only if the proposed allowed uses that reduce the MPA below moderate-high are those intended to accommodate tribal activities. Figure 3.2 contains similar information to 3.1, but is conducted only for estuarine habitats. Figure 3.3 shows the number of open coast MPAs that contain sufficient amount of each habitat to count as a replicate by bioregion for each MPA proposal at very high (Figure 3.3a), moderate-high (Figure 3.3b), and low and above protection levels (SUP [Figure 3.3c]). The portion of bars outlined in black in figure 3.3 indicates habitat replicates that occur in proposed MPAs that span the bioregion boundary and thus can reasonably be assigned to either bioregion. Figure 3.4 contains similar information to 3.3, but is conducted only for estuarine habitats. Grey bars in figures 3.1 – 3.4 indicate the number of replicates elsewhere in the biogeographic region (Point Conception to the California-Oregon border).

Key Points from the Habitat Replication Analyses (Figures 3.1 – 3.2)

- At very high protection, there are at least 3-5 replicates already existing elsewhere in the biogeographic region for all open coast and estuarine habitats except rock 100-3000m and soft 100-3000m. At moderate-high protection, there are at least 3-5 replicates already existing elsewhere in the biogeographic region for all open coast and estuarine habitats.
- At very high protection, NCP includes at least one replicate and up to 5 replicates of each open coast habitat. Replication at very high protection is as follows: beaches (1), rocky shores (3), kelp (1), rock 0-30m (1), rock 30-100m (5), rock 100-3000m (1), soft 0-30m (3), soft 30-100m (3), soft 100-3000m (1).
- At moderate-high protection, NCP includes an additional replicate of rock 30-100m, soft 30-100m, and soft 100-3000m habitats. Total replication at moderate high protection is as follows: beaches (1), rocky shores (3), kelp (1), rock 0-30m (1), rock 30-100m (6), rock 100-3000m (1), soft 0-30m (3), soft 30-100m (4), soft 100-3000m (2).
- At low and above protection (SUP), the number of replicates increases substantially for most shoreline, nearshore, and soft-bottom habitats. Total replication at low and above protection (SUP) is as follows: beaches (6), rocky shores (7), kelp (2), rock 0-30m (2), rock 30-100m (6), rock 100-3000m (1), soft 0-30m (8), soft 30-100m (7), soft 100-3000m (4).

- At very high and moderate-high protection NCP includes one replicate for estuary, coastal marsh, and eelgrass location habitats (Ten Mile Estuary SMRMA), but no replicates of mapped eelgrass habitat which occurs only within Humboldt Bay.
- At low and above protection (SUP), includes at least one replicate of each estuarine habitat. Total replication at low and above protection (SUP) is as follows: estuary (2), coastal marsh (2), eelgrass locations (2), mapped eelgrass (1).

Key Points from the Analyses of Habitat Replication by Bioregion (Figures 3.3 – 3.4)

- Existing MPAs located in the northern bioregion of the NCCSR contribute to replication of many habitats except rock 100-3000m, soft 100-3000m, and mapped eelgrass. Replicates of habitats in existing NCCSR MPAs are counted toward replication in the southern bioregion of the NCSR. Because of the bioregional overlap between the NCCSR and the southern bioregion of the NCSR, NCP can achieve replication guidelines by replicating habitats in the northern bioregion only.
- At very high protection:
 - NCP includes at least one replicate of all open coast habitats in the southern bioregion, in addition to the already occurring habitat replicates contributed by existing MPAs in the NCCSR.
 - NCP does not include replicates of three open coast habitats (beaches, kelp, and rock 0-30m) in the northern bioregion, but includes at least one replicate of all other open coast habitats in the northern bioregion.
 - Replicates of rock 30-100m, rock 100-3000m, soft 30-100m, and soft 100-3000m are included in the Mattole Canyon SMR, which spans the bioregion boundary. These replicates that fall on the bioregional divide can reasonably be assigned to either bioregion. Note that rock 100-3000m is rare and only available in one location near the bioregion boundary, however, the other habitats are available elsewhere in the northern bioregion.
 - Each available estuarine habitat in the southern bioregion is replicated by the Ten Mile Estuary SMRMA, however none of the estuarine habitats in the northern bioregion are replicated.
- At or above moderate-high protection:
 - NCP includes additional replicates of rock 30-100m, soft 30-100m, and soft 100-3000m in the northern bioregion, but replication is not increased for any other habitat in the northern bioregion or any habitat in the southern bioregion above that evaluated at very high protection.
- At or above low protection (SUP):
 - The number of replicates in both bioregions increases substantially for beaches, rocky shores, soft 0-30m, and soft 30-100m.

- The number of replicates of soft 100-3000m habitat increases substantially in the southern bioregion only.
- The number of replicates of kelp and rock 0-30m increases in the southern bioregion only.
- Each estuarine habitat in the northern bioregion is replicated in the South Humboldt Bay SMRMA (the only estuarine MPA in the northern bioregion).
- Kelp and rock 0-30m are not replicated in the northern bioregion in any MPA regardless of LOP.

MPA Size

MPA size guidelines were developed to provide for the persistence of important bottom-dwelling fish and invertebrate groups within MPAs (see Chapter 6: MPA Size in the SAT Evaluation Methods Document for further details). To accommodate adult movements and life history needs for a range of species, science guidelines in the *California Marine Life Protection Act Master Plan for Marine Protected Areas* state that MPAs should have a minimum alongshore span of 3-6 statute miles (preferably 6-12.5 statute miles) and should extend offshore to deep waters (note that state waters generally extend offshore to 3 nautical miles). The SAT combined and simplified these two guidelines to recommend that an individual MPA or MPA cluster should have a minimum area of 9-18 square statute miles (preferably 18-36 square statute miles).

The size analysis considers the number of MPA “clusters” (adjacent MPAs at or above a given LOP) that meet the minimum and preferred size guidelines at very high, moderate-high, and low and above protection (SUP). For the supplemental evaluation, MPAs below moderate-high are included only if the proposed allowed uses that reduce the MPA below moderate-high are those intended to accommodate tribal activities. An MPA cluster may consist of a single MPA, or several contiguous MPAs. Estuarine MPAs are not included in the size analysis because the sizes of estuaries vary and their boundaries are fixed.

Figure 4.1 displays results of the MPA size analysis. Each proposal is displayed on a separate line of the figures and each circle indicates the size of an MPA “cluster”, with larger MPA clusters further to the right and smaller MPA clusters further to the left. The pink shaded area to the far left of a figure indicates MPA clusters that fall below the minimum MPA size recommended by the SAT (9 square statute miles). The yellow shaded area in the middle of the figure indicates MPA clusters that are bigger than the minimum size guideline, but smaller than the preferred size recommended by the SAT (18 square statute miles). The blue shaded area to the right of the figure indicates MPA clusters that fall within the preferred size range recommended by the SAT (18 – 36 square statute miles). At all protection levels, the sizes of two or more MPAs in a given proposal are identical or very similar. In these cases, the blue circles of very similar or identical size are encompassed within a slightly larger black circle and denoted by a number above to indicate how many MPAs are within the larger black circle (e.g. “x3” means there are three MPAs of nearly identical size). These results also are tabulated on the right hand side of the figure. Table 4.2 lists MPA cluster sizes from smallest to largest for each proposal. As with other size analyses estuarine MPAs are not included in table 4.2.

Key Points from the Size Analyses (Figure 4.1 and Table 4.2)

- At very high protection, NCP includes five proposed ‘backbone’ MPA clusters that are within the minimum size range, and one MPA below minimum size, and no MPAs within the preferred size range.
- At or above moderate-high protection:
 - None of the MPA clusters meet the preferred size guidelines.
 - One additional MPA cluster that meets the size guidelines (Point St. George Reef Offshore SMCA).
 - The size distribution of MPA clusters at moderate-high protection is only slightly different from that at very high.
- At or above low protection (SUP):
 - Eight MPA cluster meet at least the minimum size guidelines and two MPA clusters (Reading Rock SMR/SMCA and Vizcaino SMCA) meet the preferred size guidelines.
 - Five MPA clusters at low or above protection are larger than the largest MPA cluster at moderate-high or very high protection.

MPA Spacing

MPA spacing guidelines were developed to provide for the dispersal of larvae for a range of important bottom-dwelling fish and invertebrate groups between MPAs and to promote connectivity in the network. Further details on these methods are available in Chapter 7: MPA Spacing of the SAT Evaluation Methods Document. To facilitate dispersal and connectivity, spacing guidelines along the mainland recommend that habitats be replicated in MPAs placed at a maximum of 31-62 statute miles from each other. Since marine populations are generally habitat specific, the spacing evaluation is conducted for each habitat. To be included in the spacing analysis, habitats must be protected in sufficient quantity to count as a replicate, which encompasses the amount of habitat needed to include 90% of the associated species (see habitat replication, above). MPAs or MPA clusters also must meet the minimum size guidelines (9 square statute miles) to be included in the spacing analysis.

Spacing analyses include 1) the maximum distance (gap) between MPA clusters that include a replicate of each habitat (figures 5.1-5.2) and 2) the number of spacing gaps that exceed SAT spacing guidelines (> 62 square statute miles) for a given habitat (Figure 5.3 a-d). Both analyses are conducted for MPAs at very high, moderate-high, and low and above protection (SUP). For the supplemental evaluation, MPAs below moderate-high are included only if the proposed allowed uses that reduce the MPA below moderate-high are those intended to accommodate tribal activities.

Maximum Distance (gap)

Figure 5.1 displays the results of the MPA spacing analysis for all open coast habitats. Figure 5.2 displays the results of the MPA spacing analysis for all estuarine habitats. The height of

each bar indicates the maximum distance between adjacent habitat replicates in a given proposal. These maximum distances, or gaps, for each habitat may be compared to the spacing guidelines, a maximum of 31 to 62 miles between MPAs, which is indicated by the horizontal dashed red lines on the figure. Habitats marked with an asterisk in the legend are distributed such that it is not possible for the spacing guidelines to be met. For all habitats, spacing in excess of the guideline or minimum possible gap is reflected with hatch marks across the bars.

Gaps that Exceed the SAT Spacing Guidelines

Table 5.3a-d provides the number of spacing gaps that exceed SAT spacing guidelines between adjacent MPA clusters for a given habitat. The location and distance of each gap also is identified for each habitat. The intent of this analysis is to provide detailed information about spacing gaps by habitat for each proposal, in order to identify specific MPA proposal designs that result in large spacing gaps that could compromise the network function of the proposed MPAs.

Key Points from the Spacing Analyses (Figures 5.1 and 5.2, Table 5.3)

Open Coast Habitats

- Habitat spacing guidelines cannot be met for three open coast habitats: Kelp (115 mi minimum gap), rock 100-3000m (110 mi minimum gap), and soft bottom 100-3000m (95 mi minimum gap).
- At very high protection:
 - NCP approaches the SAT spacing guidelines for two habitats: rock 30-100m and soft 30-100m.
 - NCP has spacing gaps for the remaining habitats, including: beaches, rocky shores, kelp, rock 0-30m, rock 100-3000m, soft 0-30m, soft 100-3000m, estuary, marsh and eelgrass.
- At or above moderate-high protection:
 - NCP achieves or approaches the SAT spacing guidelines or minimum possible spacing for three habitats: rock 30-100m, rock 100-3000m, and soft 30-100m.
 - NCP has spacing gaps for the remaining habitats, including: beaches, rocky shores, kelp, rock 0-30m, soft 0-30m, soft 100-3000m, estuary, marsh and eelgrass.
- At or above low protection (SUP):
 - NCP achieves or approaches the SAT spacing guidelines or minimum possible spacing for five habitats: rocky shores, rock 30-100m, rock 100-3000m, soft 30-100m, and soft 100-3000m.
 - NCP has spacing gaps for the remaining habitats, including: beaches, kelp, rock 0-30m, soft 0-30m, estuary, marsh and eelgrass.

- **Beaches:** Gaps between replicates of beach habitat in the NCP exceed the SAT spacing guidelines at very high and moderate-high protection because the only replicate of this habitat included at or above moderate-high protection occurs in the Ten Mile SMR, 174 miles from the Oregon border and 95 miles from Bodega Head SMR (the nearest replicate to the south). In the supplemental evaluation (SUP) gaps for beach habitat are reduced by replication of beach habitat in numerous MPAs at moderate-low and low protection, however, one gap in excess of the SAT guidelines remains. This gap occurs between the Ten Mile cluster and Bodega Head cluster in the NCCSR (95 mi); this gap was increased from 64 miles to 95 miles, after the California Fish and Game Commission amended Stewarts Point SMR (north central coast MPA), which caused this MPA to lose a replicate of beach habitat. Beach habitat is abundant in the study region with replicates available along most sections of the coast (Figures 1.1-1.2).
- **Rocky Shores:** Gaps between replicates of rocky shore habitat in the NCP exceed the SAT spacing guidelines at very high and moderate-high protection, because no replicates of this habitat are included at or above moderate-high LOP between the South Cape Mendocino SMR and the Oregon border (109 mi). In the supplemental evaluation (SUP), all gaps are within the SAT spacing guidelines due to inclusion of rocky shore replicates in the Pyramid Point and Reading Rock SMCAs (both at low protection). Rocky shore habitat is abundant in the study region with replicates available along most sections of the coast except a stretch near the mouth of Humboldt Bay (Figures 1.1-1.2).
- **Kelp:** Achieving minimum possible spacing for kelp habitat would require placement of MPAs that replicate kelp habitat near Crescent City and Shelter Cove. The furthest north MPA in which NCP replicates kelp habitat is the Vizcaino SMCA, which is included in the supplemental evaluation only. As a result, at the low or above protection level, one gap of 160 miles remains between the Oregon border and Vizcaino SMCA.
- **Rock 0-30m:** Gaps between replicates of rock 0-30m habitat in the NCP exceed the SAT spacing guidelines at very high and moderate-high protection, because the only replicate of this habitat included at or above moderate-high protection occurs in the Ten Mile SMR, 174 miles from the Oregon border and 40 miles from the Pt. Arena cluster (the nearest replicate to the south in the NCCSR). In the supplemental evaluation (SUP), the maximum gap is reduced slightly due to inclusion of a rock 0-30m replicate in the Vizcaino SMCA, however rock 0-30m is not replicated in any MPA in the northern bioregion. Rock 0-30m habitat is abundant in the southern bioregion, but unevenly distributed in the northern bioregion, with replicates available only near Trinidad and Crescent City (Figures 1.1-1.2).
- **Rock 30-100m:** At very high protection gaps between replicates of rock 30-100m habitat in the NCP approach the SAT spacing guidelines, with only one gap (64 miles between the Ten Mile SMR and Stewarts Point SMR) in excess of the guideline. At moderate-high protection all gaps between replicates of rock 30-100m are within the SAT spacing guidelines.
- **Rock 100-3000m:** At both very high and moderate-high protection, NCP approaches the minimum possible spacing for rock 100-3000m habitat by including this habitat in the Mattole Canyon SMR, the only location in the NCSR known to have sufficient habitat to count as a replicate (Figures 1.1-1.2).

- Soft 0-30m: Gaps between replicates of soft 0-30m habitat in the NCP exceed the SAT spacing guidelines at very high and moderate-high protection, because there are no replicates between the South Cape Mendocino SMR and the Oregon border (109 mi). In the supplemental evaluation (SUP), gaps for soft 0-30m habitat are reduced by replication of this habitat in numerous MPAs at moderate-low and low protection, however, one gap in excess of the SAT guidelines remains. This gap occurs between the Ten Mile cluster and Bodega Head cluster in the NCCSR (95 mi). Soft 0-30m habitat is abundant in the study region with replicates available along most sections of the coast (Figures 1.1-1.2).
- Soft 30-100m: At very high and moderate-high protection, gaps between replicates of soft 30-100m habitat in the NCP approach the SAT spacing guidelines, with two gaps slightly in excess of the SAT guidelines (67 miles between the Mattole Canyon SMR and Reading Rock SMR, and 64 miles between the Ten Mile SMR and Stewarts Point SMR). In the supplemental evaluation, gaps are reduced by replication of this habitat in numerous MPAs at moderate-low and low protection, however, the 64 mile gap between the Ten Mile SMR and Stewarts Point SMR remains.
- Soft 100-3000m: By including replicates of soft 100-3000m habitat in the Point St. George SMCA and the Mattole Canyon SMR, NCP achieves a 121 mile gap for soft 100-3000m habitat at very high and moderate-high protection. This gap is further reduced to 102 miles (approaching the minimum possible gap) in the supplemental evaluation by inclusion of a replicate of soft 100-3000m habitat in the Vizcaino SMCA.

Estuarine Habitats

- Habitat spacing guidelines cannot be met for any of the three estuarine habitats: estuary (64 mi minimum gap), coastal marsh (83 mi minimum gap), and eelgrass locations (83 mi minimum gap).
- NCP does not approach the SAT spacing guidelines or minimum possible spacing for any estuarine habitat at or above moderate-high protection.
- NCP approaches the minimum possible spacing for coastal marsh at or above low protection (supplemental evaluation).
- Estuary: Gaps between replicates of estuary habitat in the NCP exceed the SAT spacing guidelines at very high and moderate-high protection, because the only replicate of this habitat included at or above moderate-high protection occurs in the Ten Mile Estuary SMRMA, 181 miles from the Chetco River in Oregon and 89 miles from the Russian River SMRMA (the nearest replicate to the south in the NCCSR). In the supplemental evaluation (SUP), the maximum gap is reduced slightly due to inclusion of estuary replicates in the South Humboldt Bay SMRMA. Several gaps in excess of the SAT spacing guidelines still remain, however, including an 89 mile gap between the Chetco River, OR and the South Humboldt Bay SMRMA, a 92 mile gap between the South Humboldt Bay SMRMA and the Ten Mile Estuary SMRMA, and an 89 mile gap between Ten Mile Estuary SMRMA and the Russian River SMRMA. The estuarine MPA at the Navarro River estuary is below the minimum size to count as an estuarine replicate (0.12 sq mi).

- Coastal Marsh: Gaps between replicates of coastal marsh habitat in the NCP exceed the SAT spacing guidelines at very high and moderate-high protection, because the only replicate of this habitat included at or above moderate-high protection occurs in the Ten Mile Estuary SMRMA, 181 miles from the Chetco River in Oregon and 89 miles from the Russian River SMRMA (the nearest replicate to the south in the NCCSR). In the supplemental evaluation (SUP), the maximum gap is reduced slightly due to inclusion of a coastal marsh replicate in the South Humboldt Bay SMRMA. Several gaps in excess of the SAT spacing guidelines still remain, however, including an 89 mile gap between the Chetco River, Oregon and the South Humboldt Bay SMRMA, a 92 mile gap between the South Humboldt Bay SMRMA and the Ten Mile Estuary SMRMA, and an 89 mile gap between the Ten Mile MPA and the Russian River SMRMA.
- Eelgrass: Gaps between replicates of known eelgrass locations in the NCP exceed the SAT spacing guidelines at very high and moderate-high protection, because the only replicate of this habitat included at or above moderate-high protection occurs in the Ten Mile Estuary SMRMA, 181 miles from the Chetco River in Oregon and 103 miles from the Estero Americano SMRMA (the nearest replicate to the south). In the supplemental evaluation (SUP), the maximum gap is reduced slightly due to inclusion of eelgrass replicates in the South Humboldt Bay SMRMA. Several gaps in excess of the SAT spacing guidelines still remain, however, including an 89 mile gap between the Chetco River, Oregon and the South Humboldt Bay SMRMA, a 92 mile gap between the South Humboldt Bay SMRMA and the Ten Mile Estuary SMRMA, and a 103 mile gap between the Ten Mile Estuary SMRMA and the Estero Americano SMRMA.

Figure 1.1: North Coast Study Region Habitat Availability

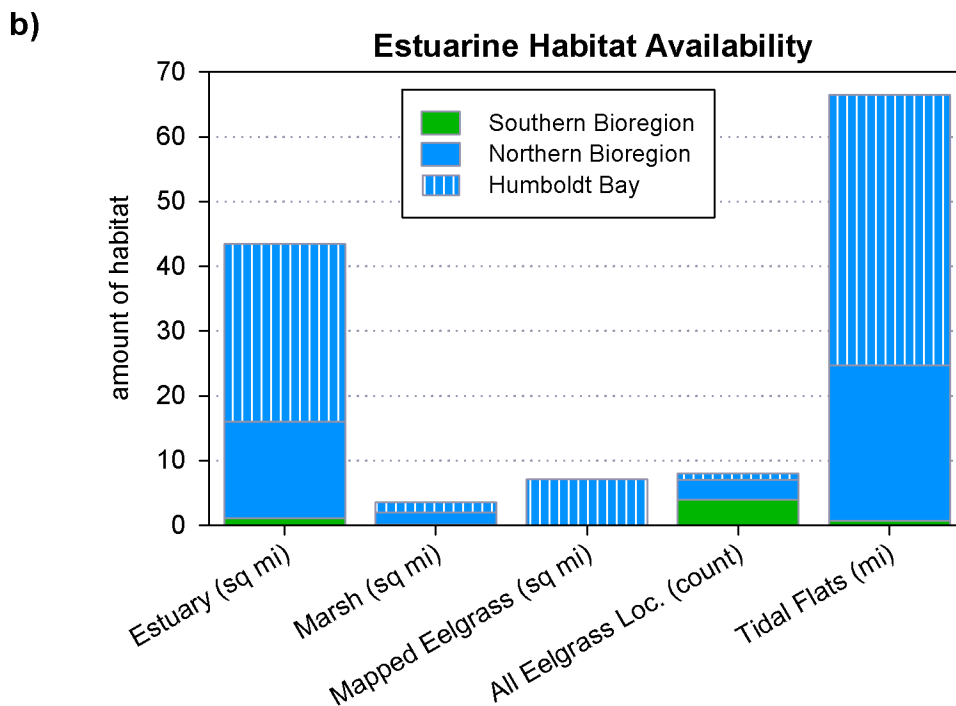
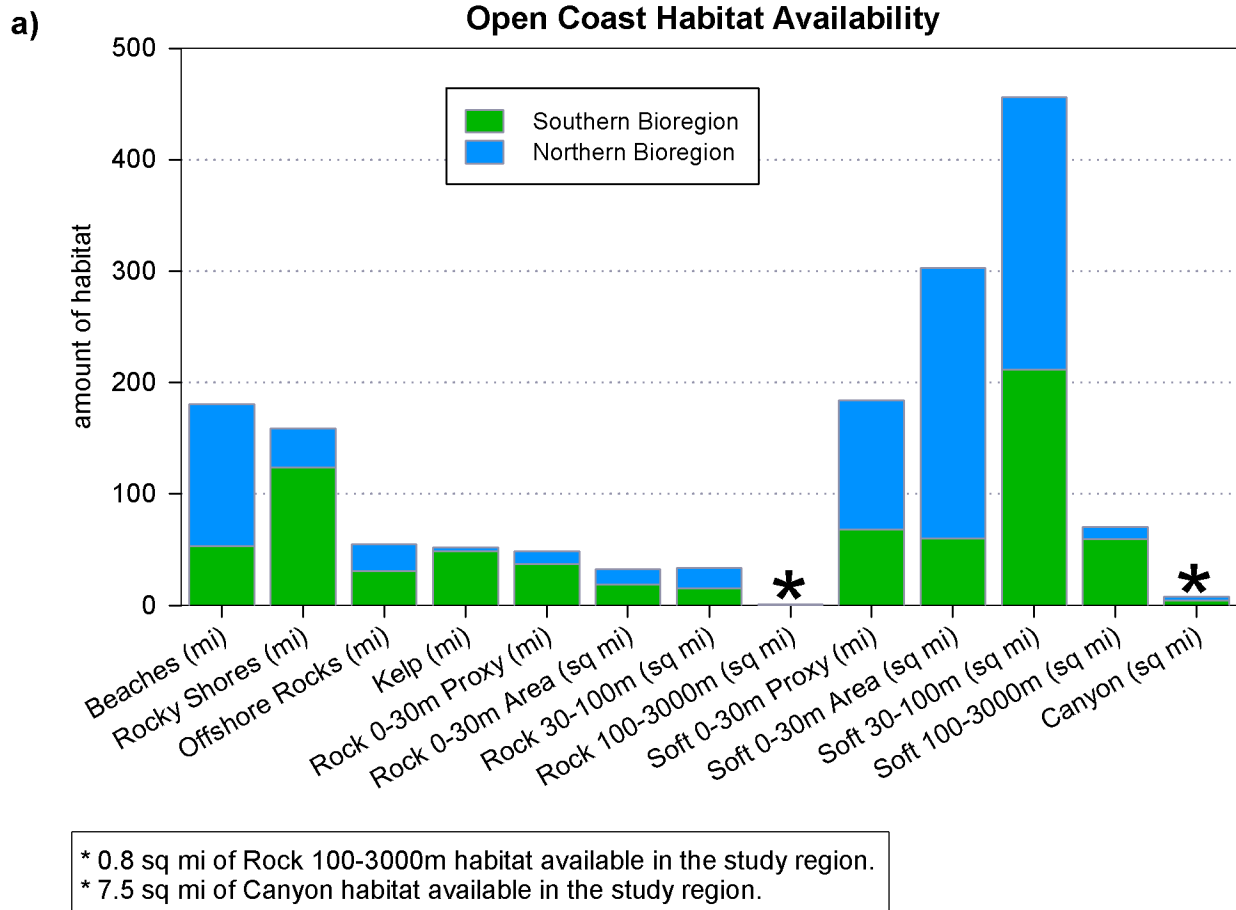


Figure 1.2: Geographic Availability of Open Coast Habitat Replicates in the North Coast Study Region

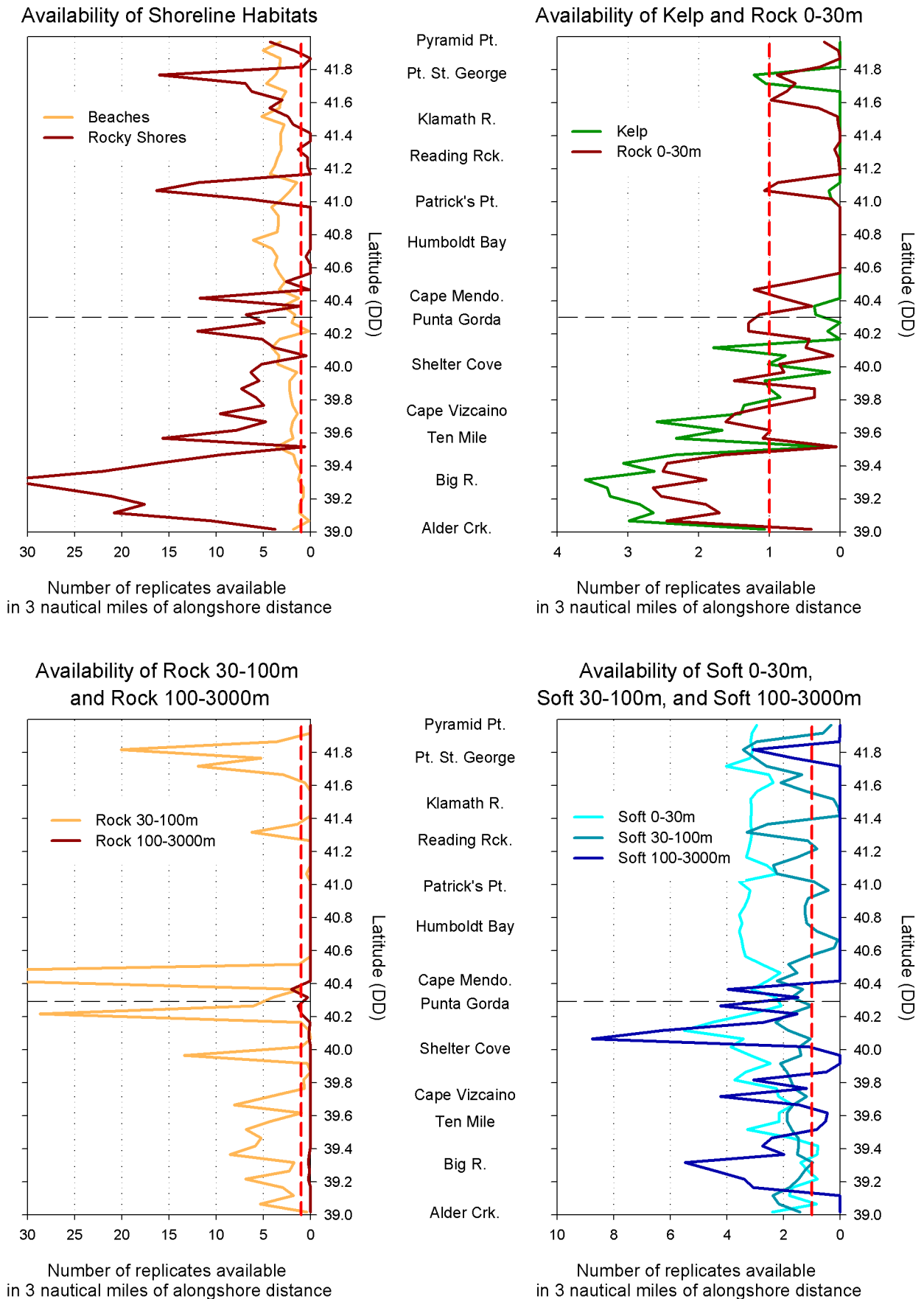
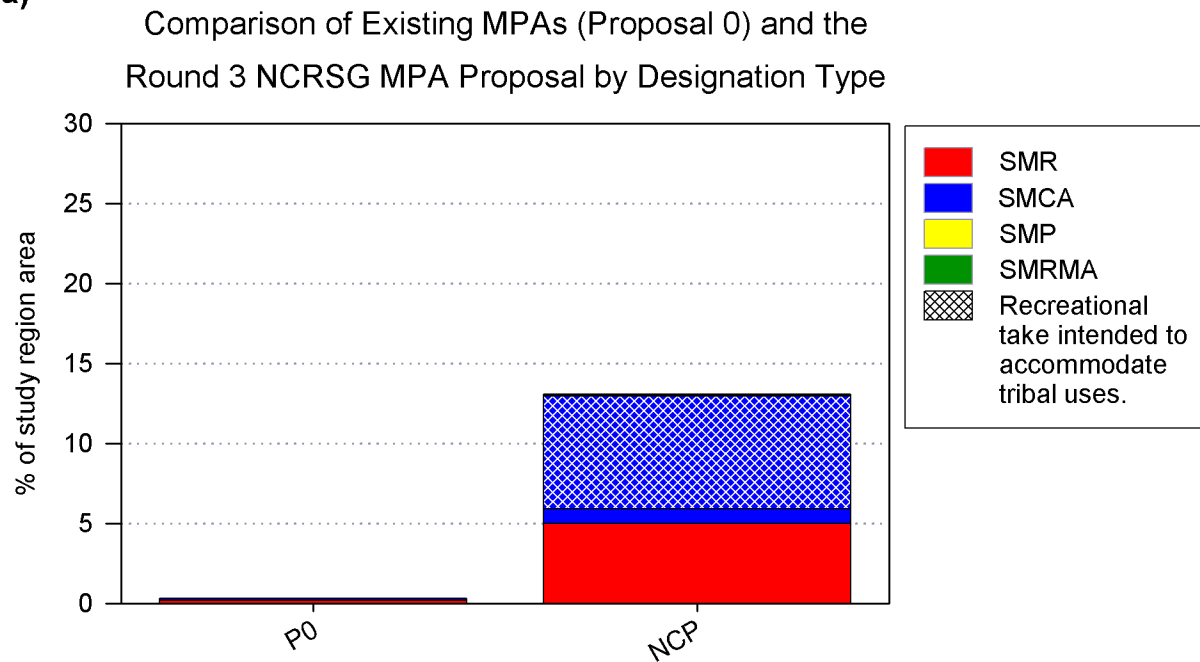


Figure 1.3: Summary of MPA Designations and Levels of Protection for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal

a)



b)

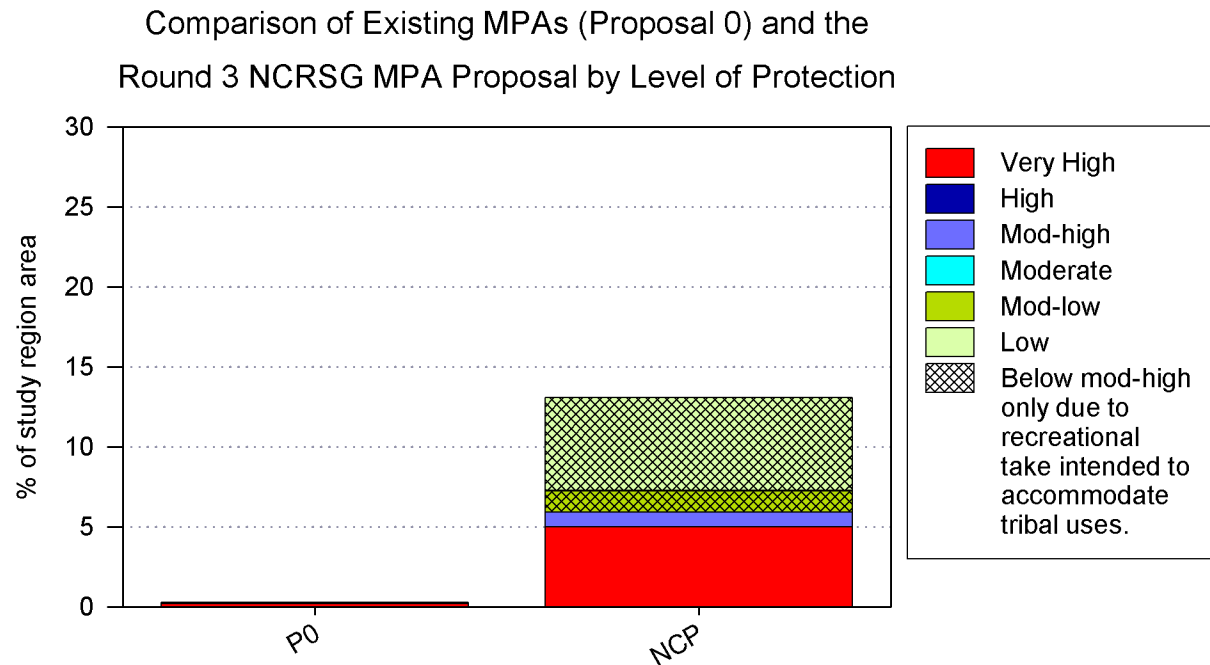


Figure 2.1: Rocky Habitat Representation for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal

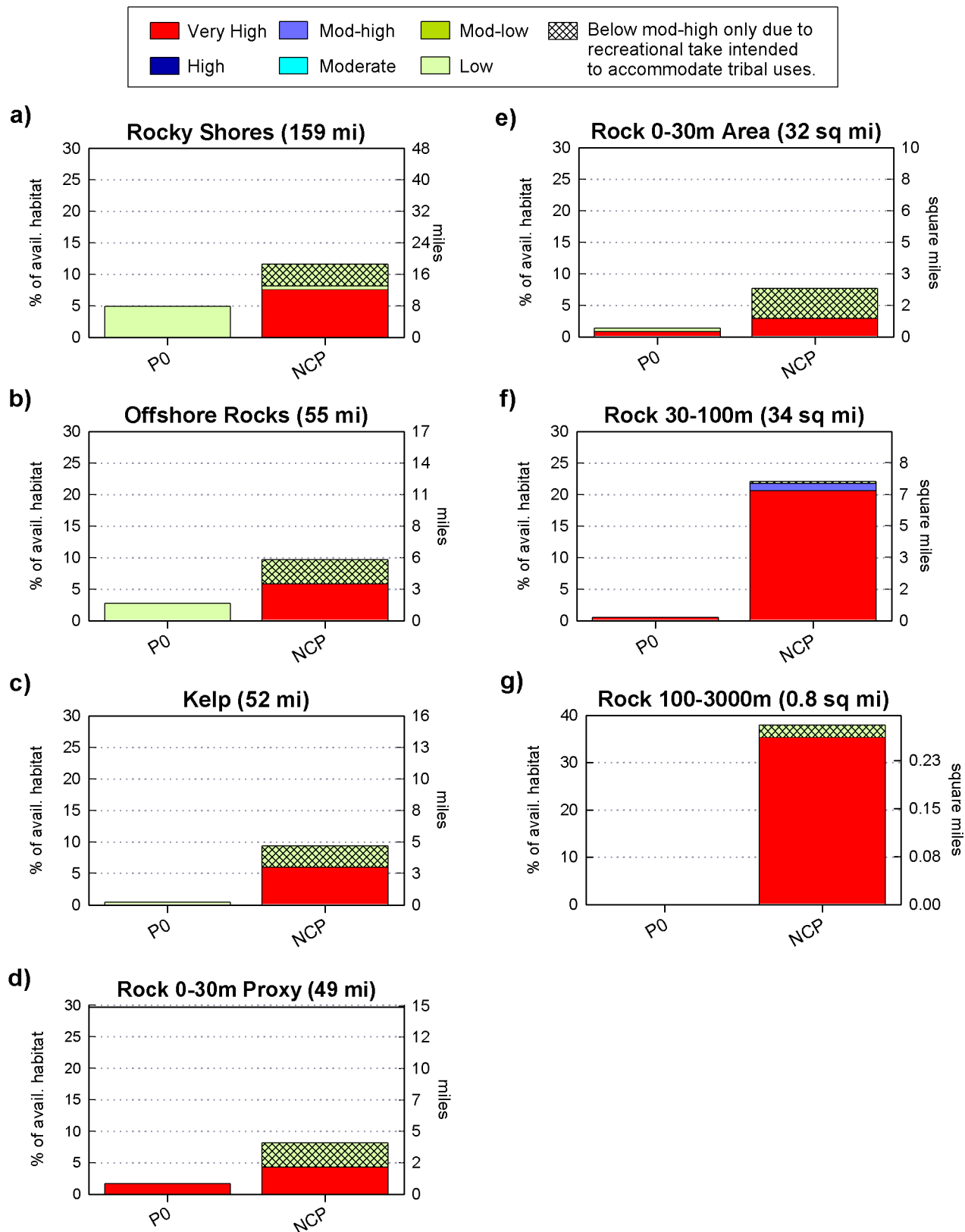


Figure 2.2: Soft Bottom Habitat Representation for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal

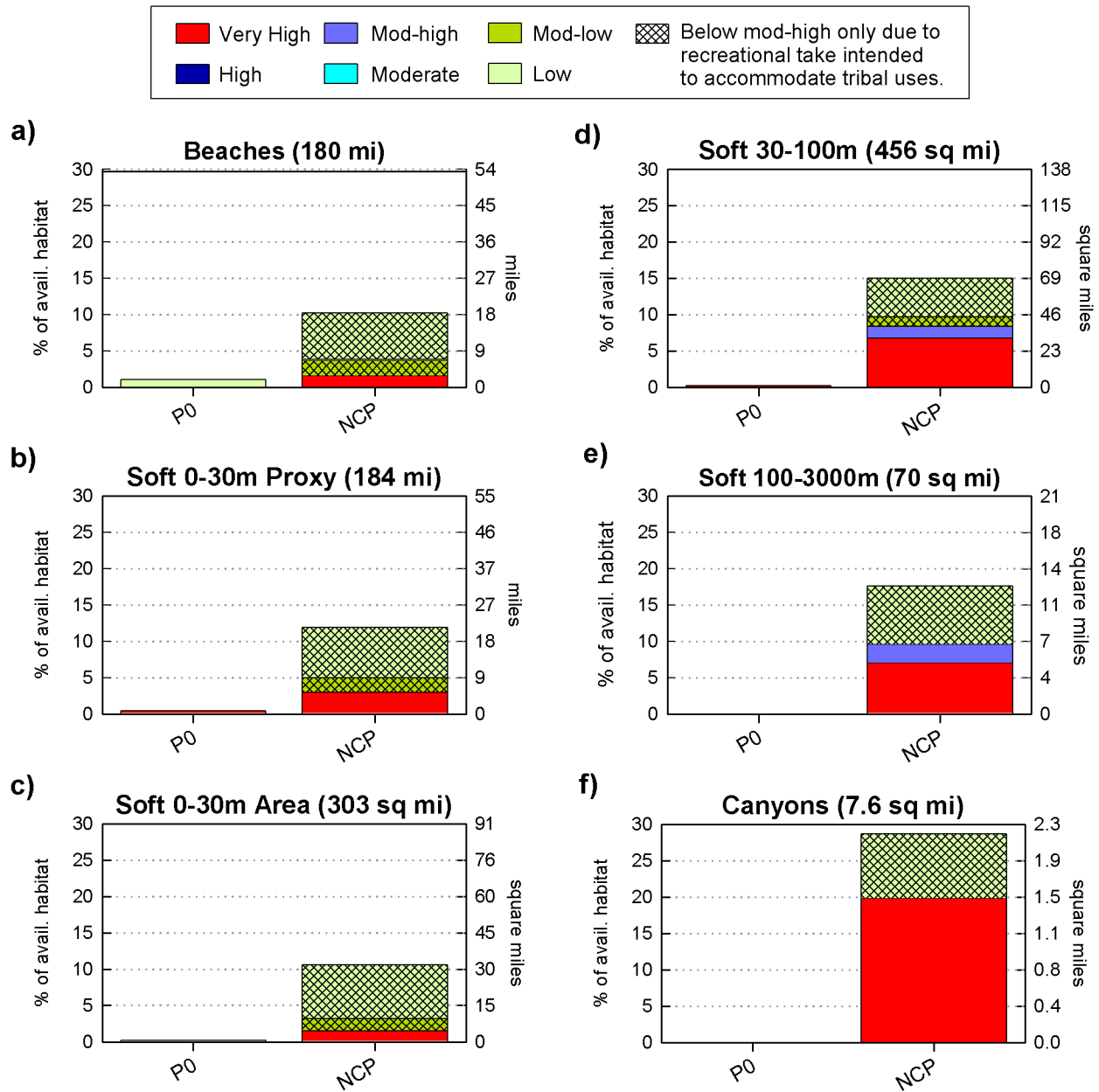


Figure 2.3: Estuarine Habitat Representation by Bioregion for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal

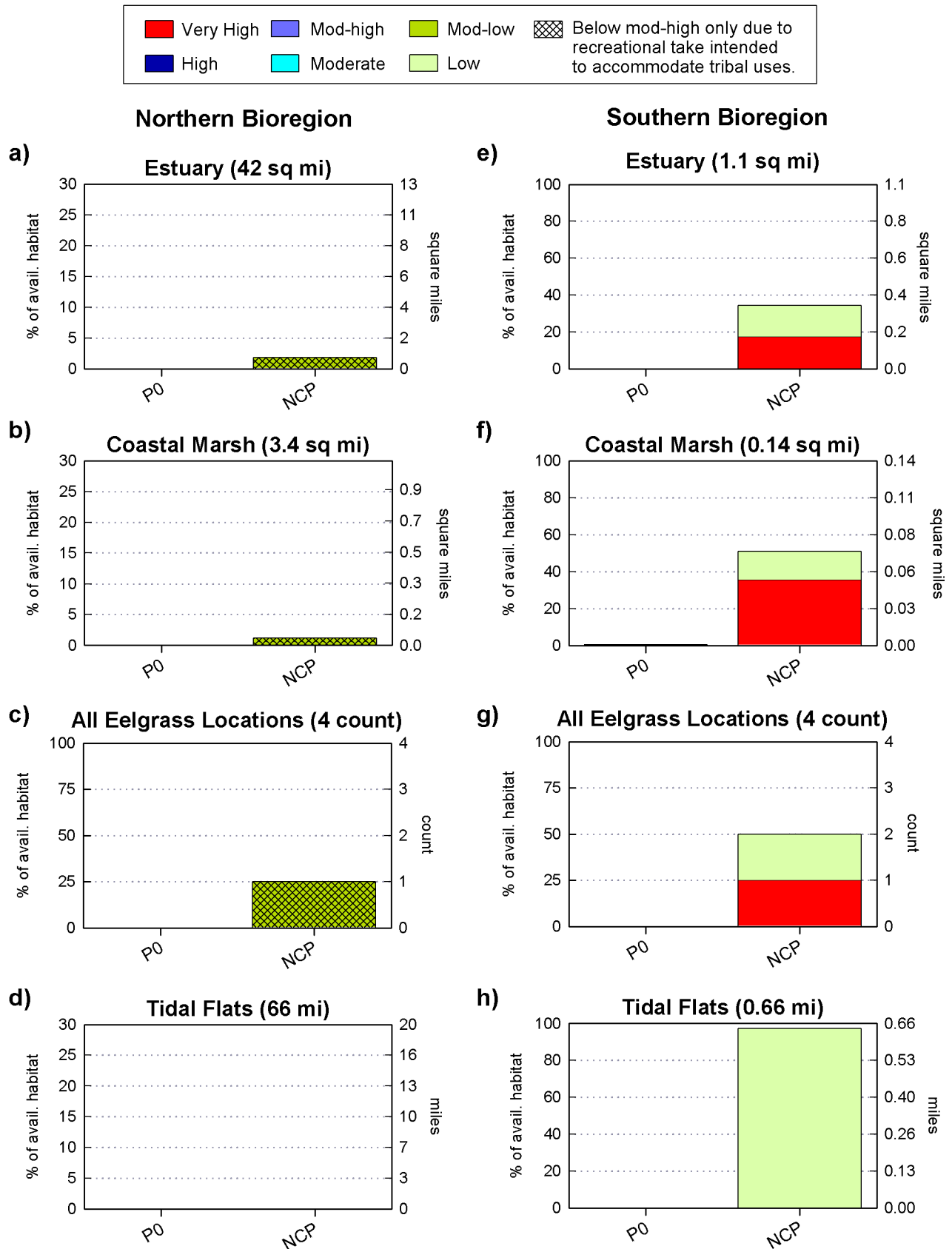
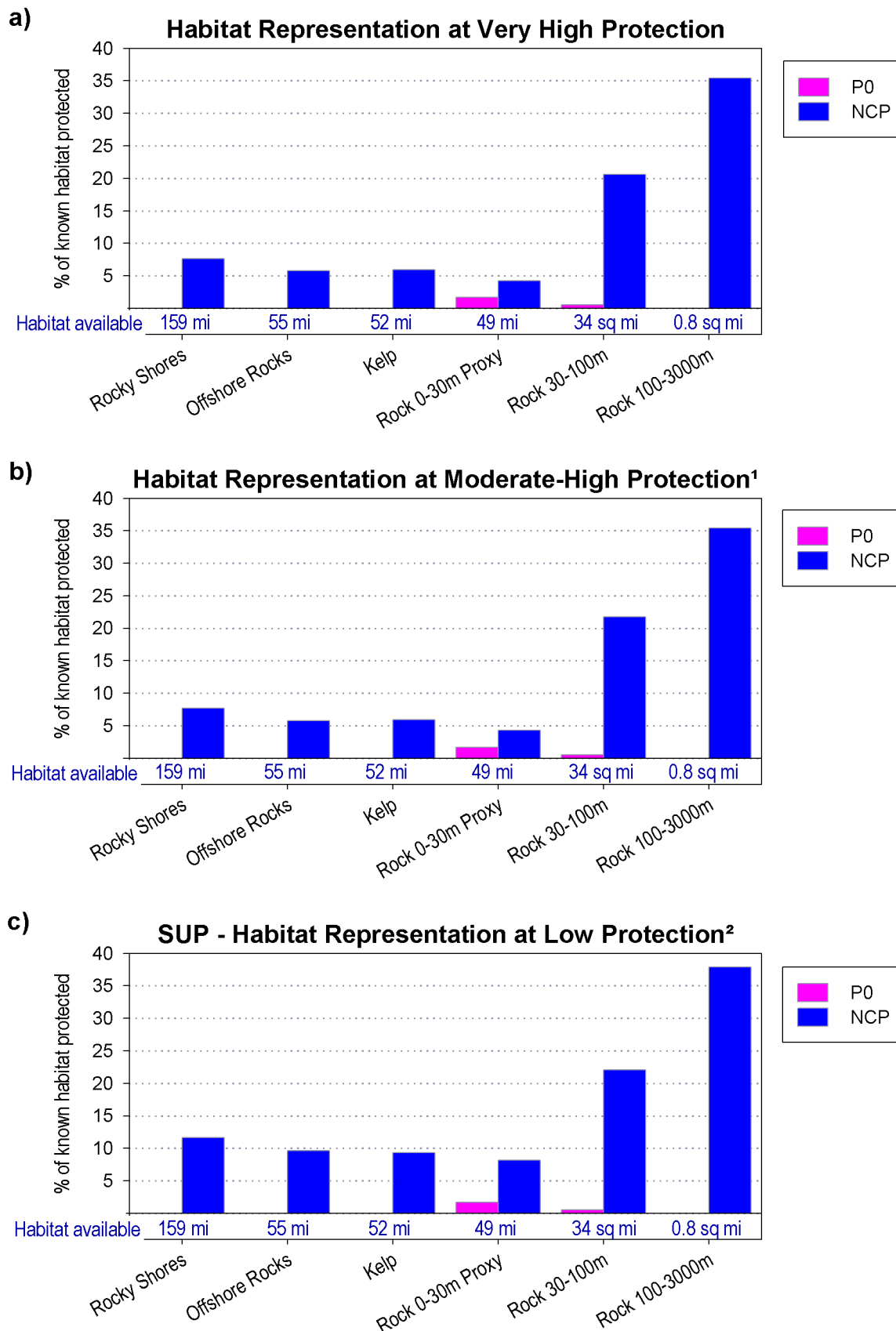


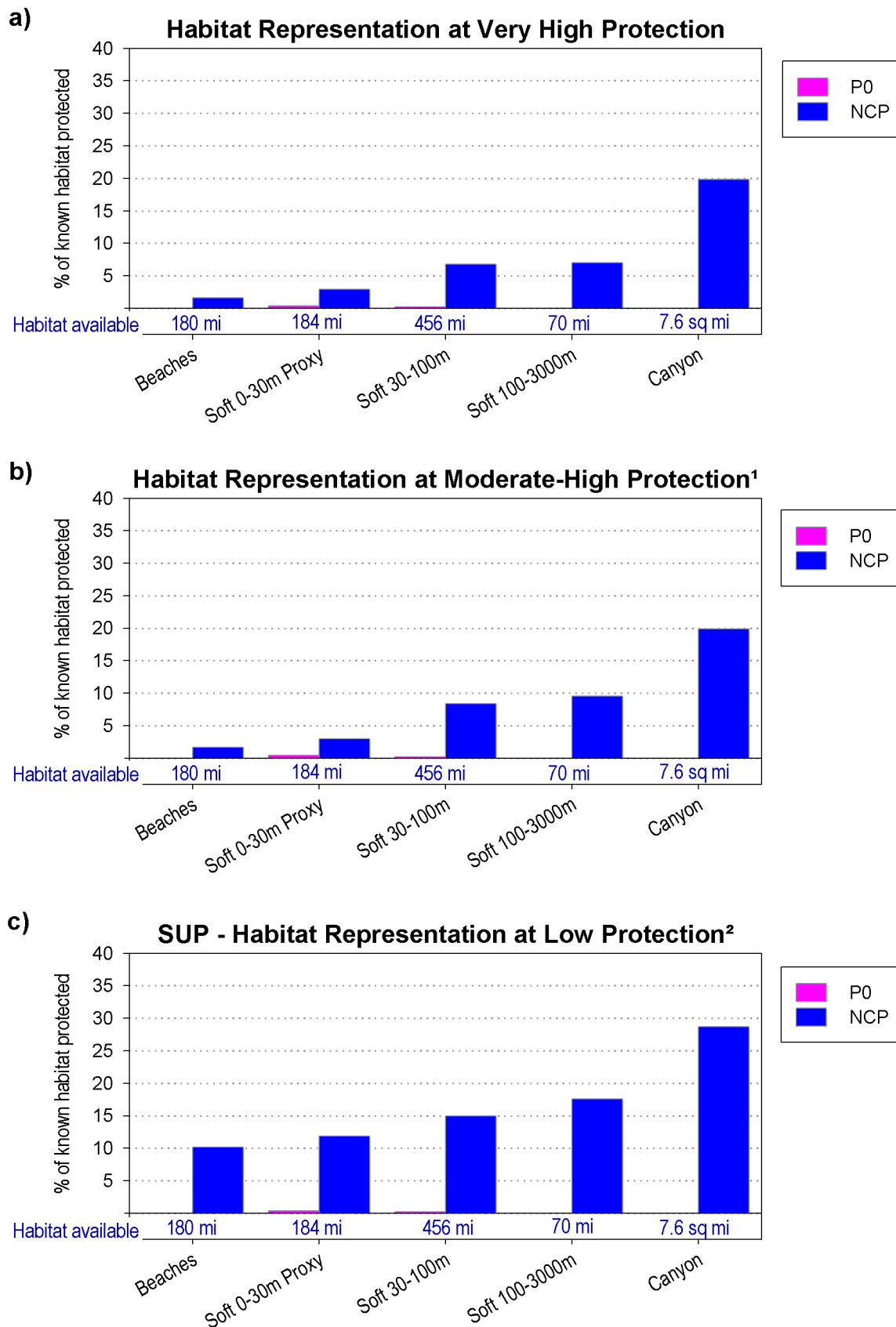
Figure 2.4: Rocky Habitat Representation Overview for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)



¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

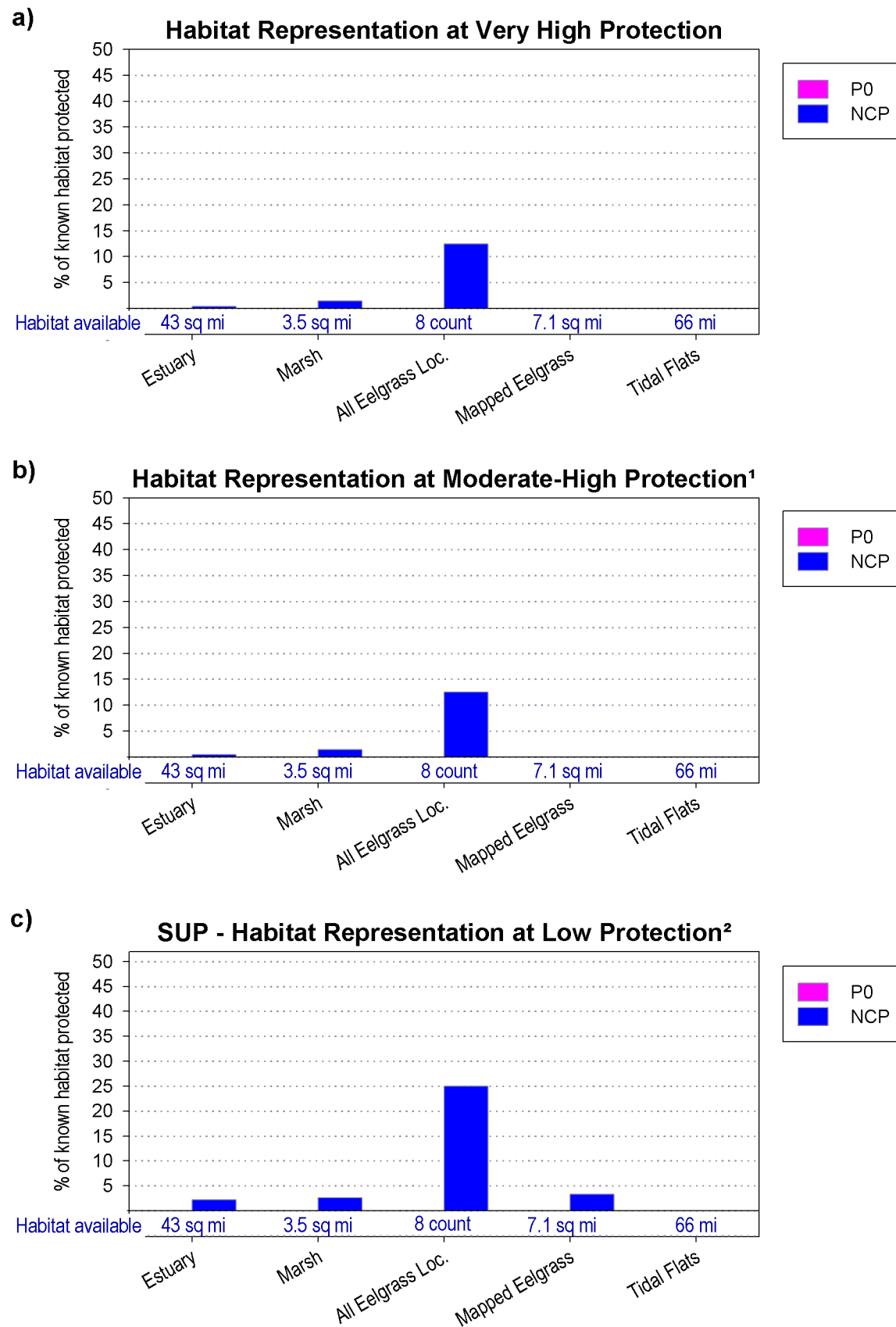
Figure 2.5: Soft Bottom Habitat Representation Overview for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)



¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

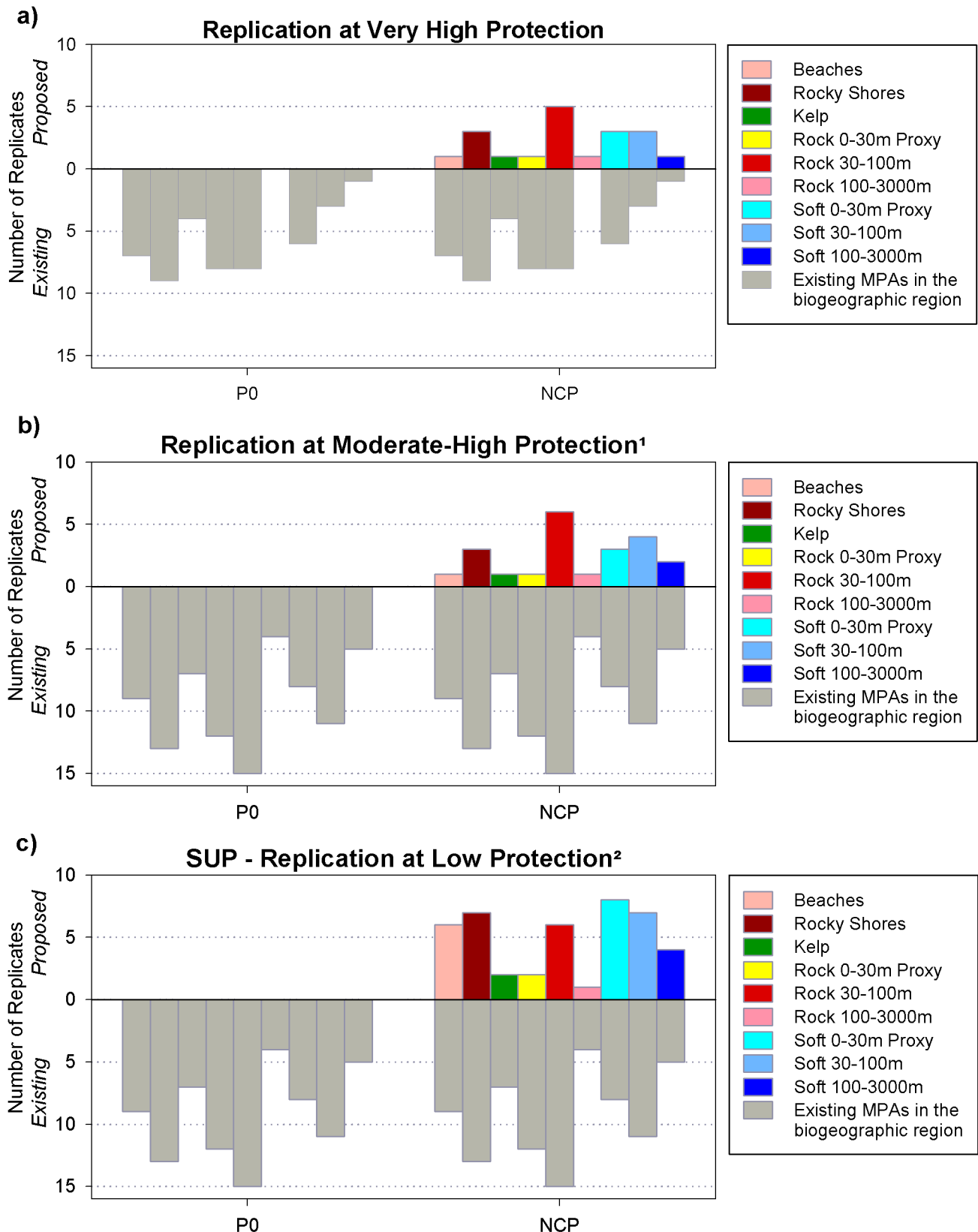
Figure 2.6: Estuarine Habitat Representation Overview for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)



¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

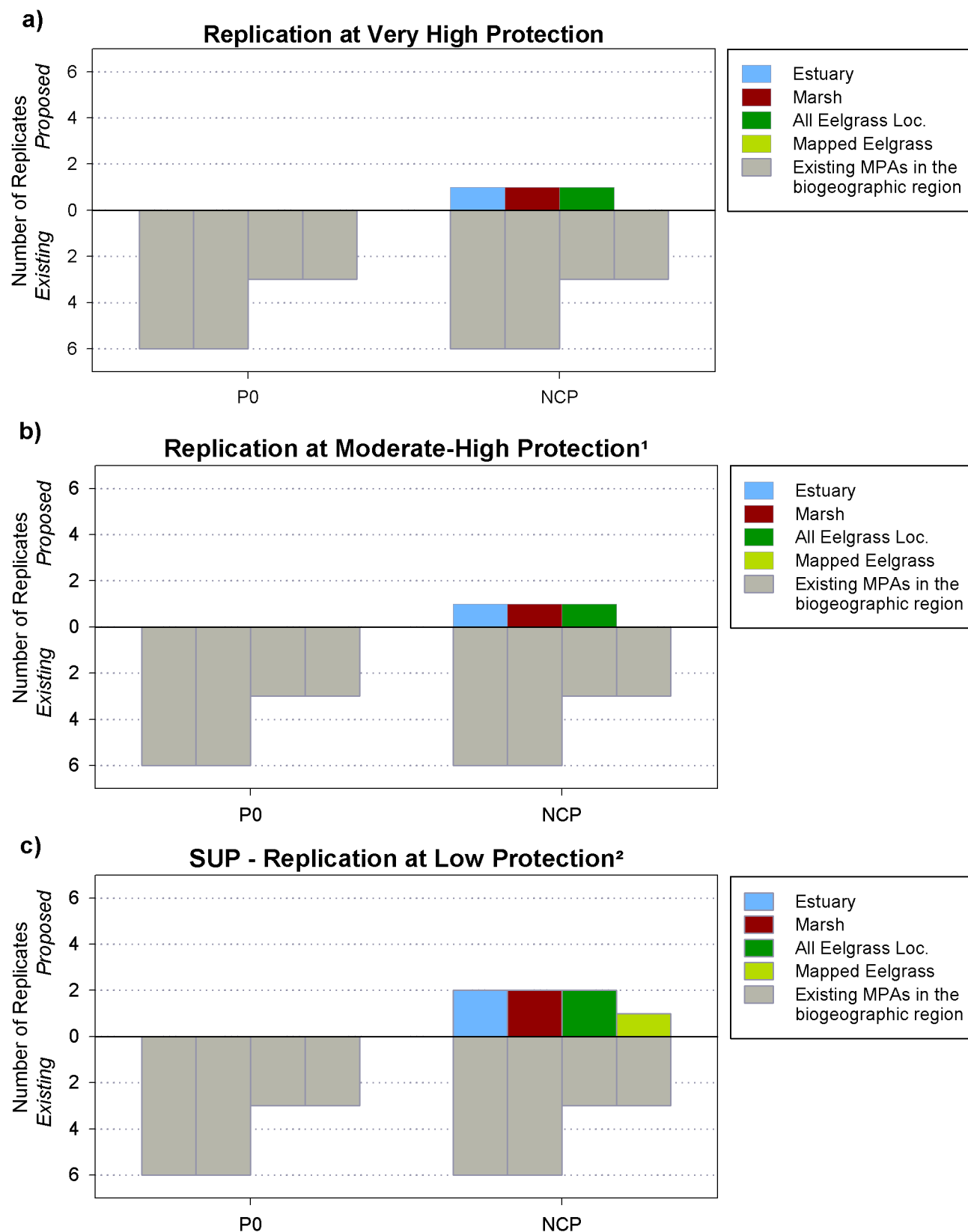
Figure 3.1: Open Coast Habitat Replication for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)



¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

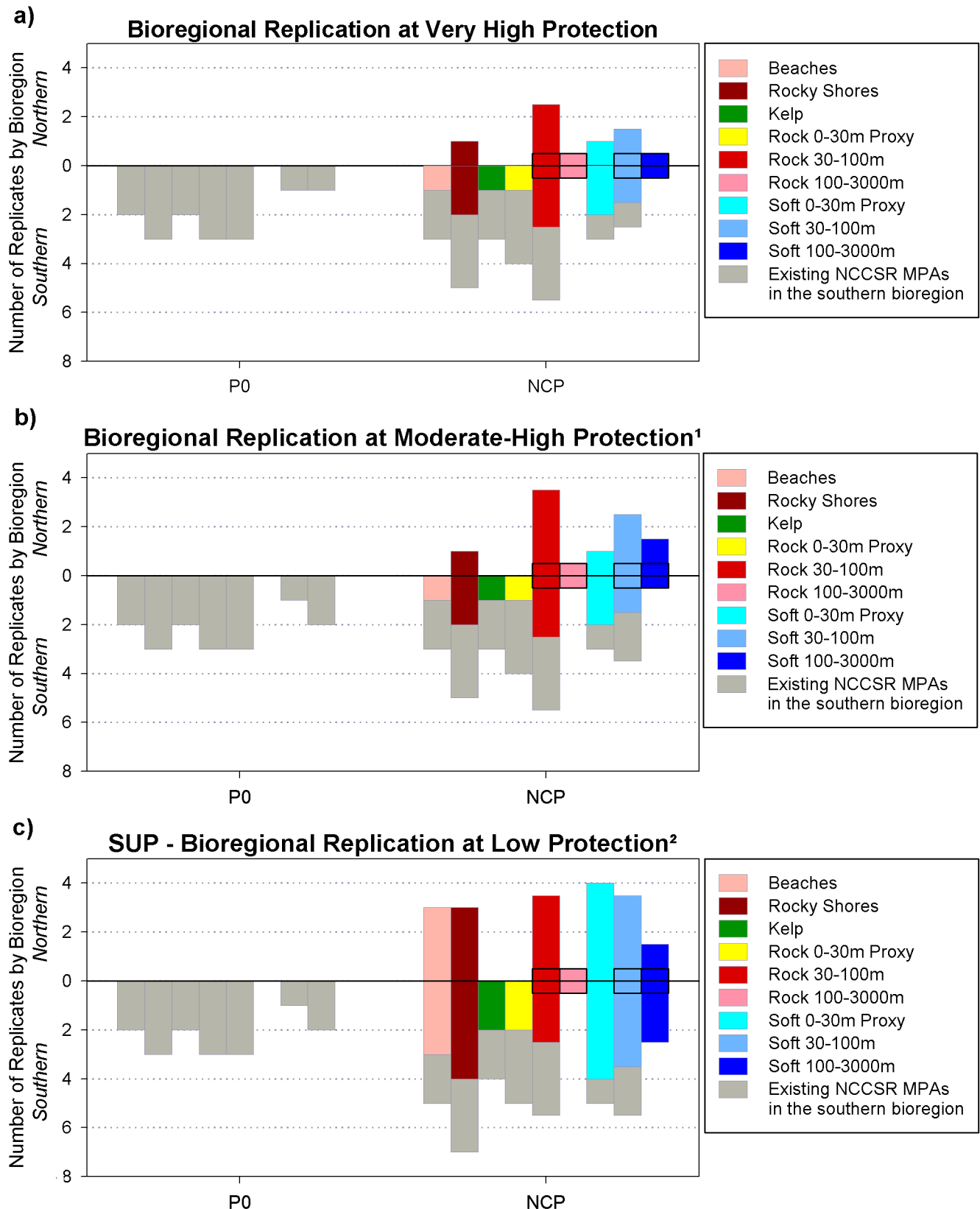
Figure 3.2: Estuarine Habitat Replication for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)



¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

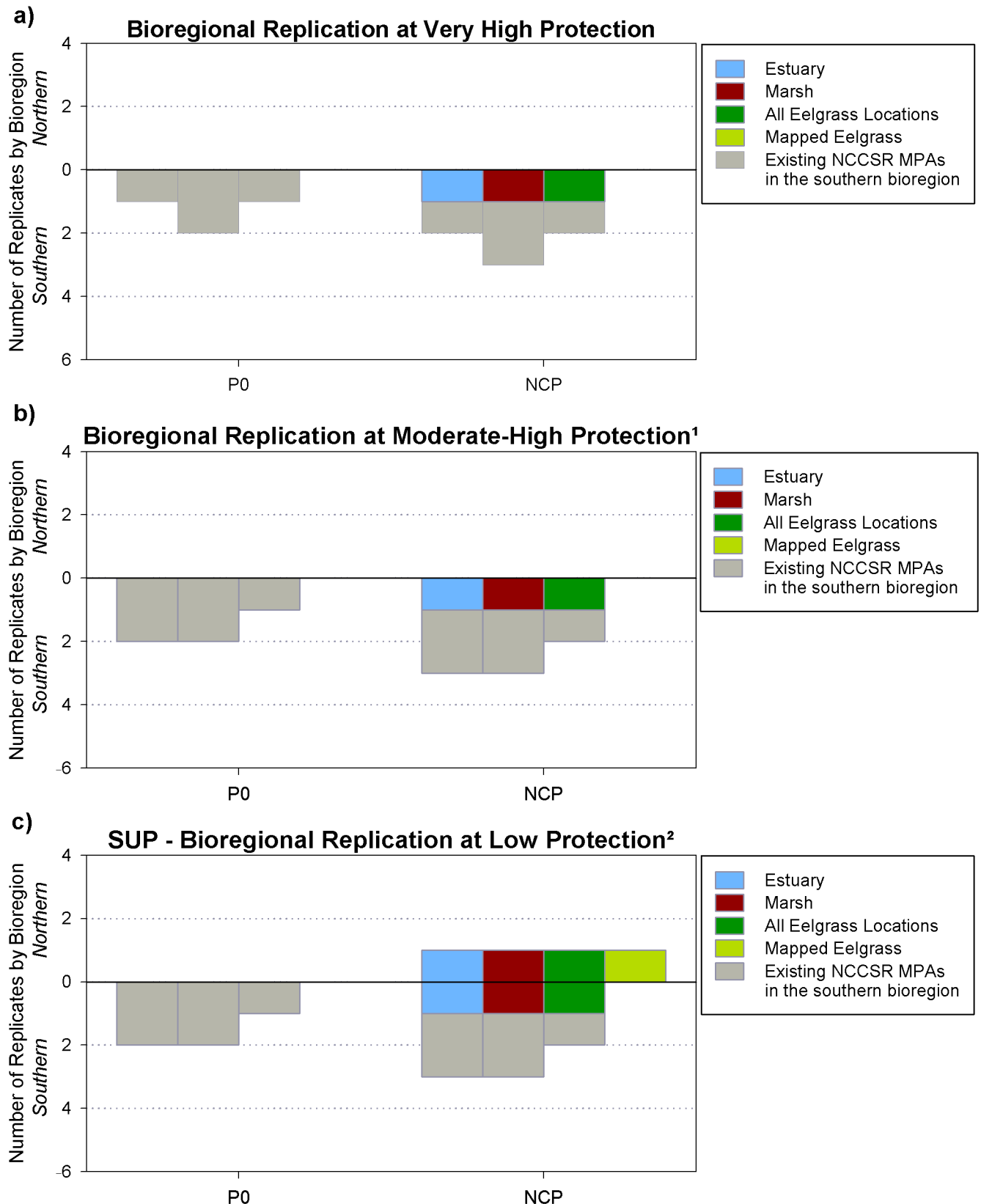
Figure 3.3: Open Coast Habitat Replication by Bioregion for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)



¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

Figure 3.4: Estuarine Habitat Replication by Bioregion for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)

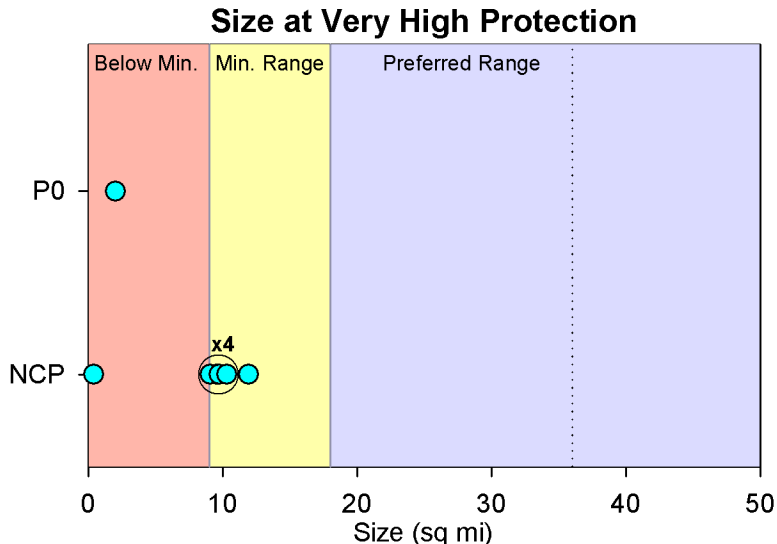


¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

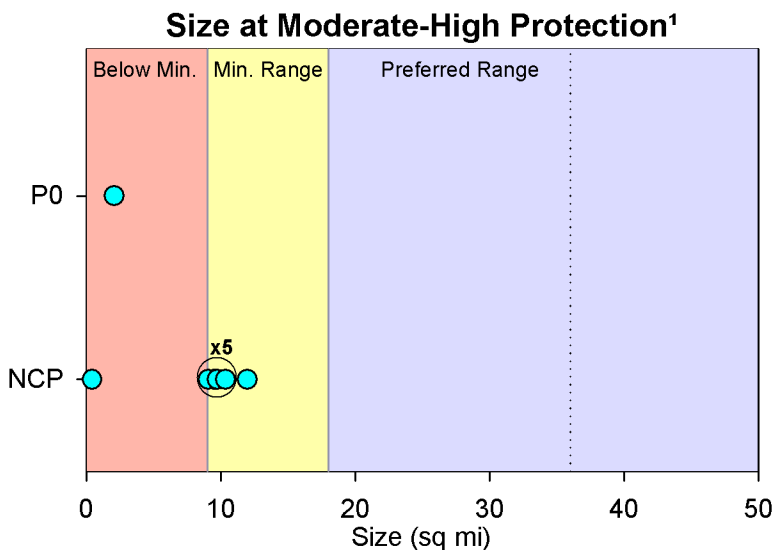
Figure 4.1: MPA Cluster Size for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)

a)



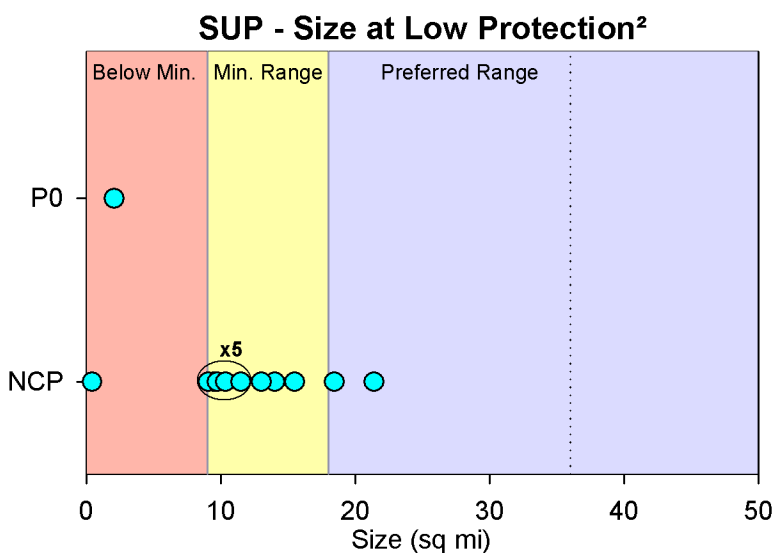
Number of MPA Clusters at Very High Protection				
Proposal	Below Min. Size	Min. Size Range	Pref. Size Range	Total # Clusters
P0	1	0	0	1
NCP	1	5	0	6

b)



Number of MPA Clusters at Moderate-High Protection				
Proposal	Below Min. Size	Min. Size Range	Pref. Size Range	Total # Clusters
P0	1	0	0	1
NCP	1	6	0	7

c)



Number of MPA Clusters at Low Protection ²				
Proposal	Below Min. Size	Min. Size Range	Pref. Size Range	Total # Clusters
P0	1	0	0	1
NCP	1	8	2	11

¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

Table 4.2: MPA Cluster size for Existing MPAs (P0) and and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)

Very High Protection	Proposal	
	Proposal 0	NCRSG MPA Proposal
Cluster size in square miles from smallest to largest excluding estuarine MPAs.	2.1	0.4
		9.1
		9.6
		9.8
		10.4
		12.0

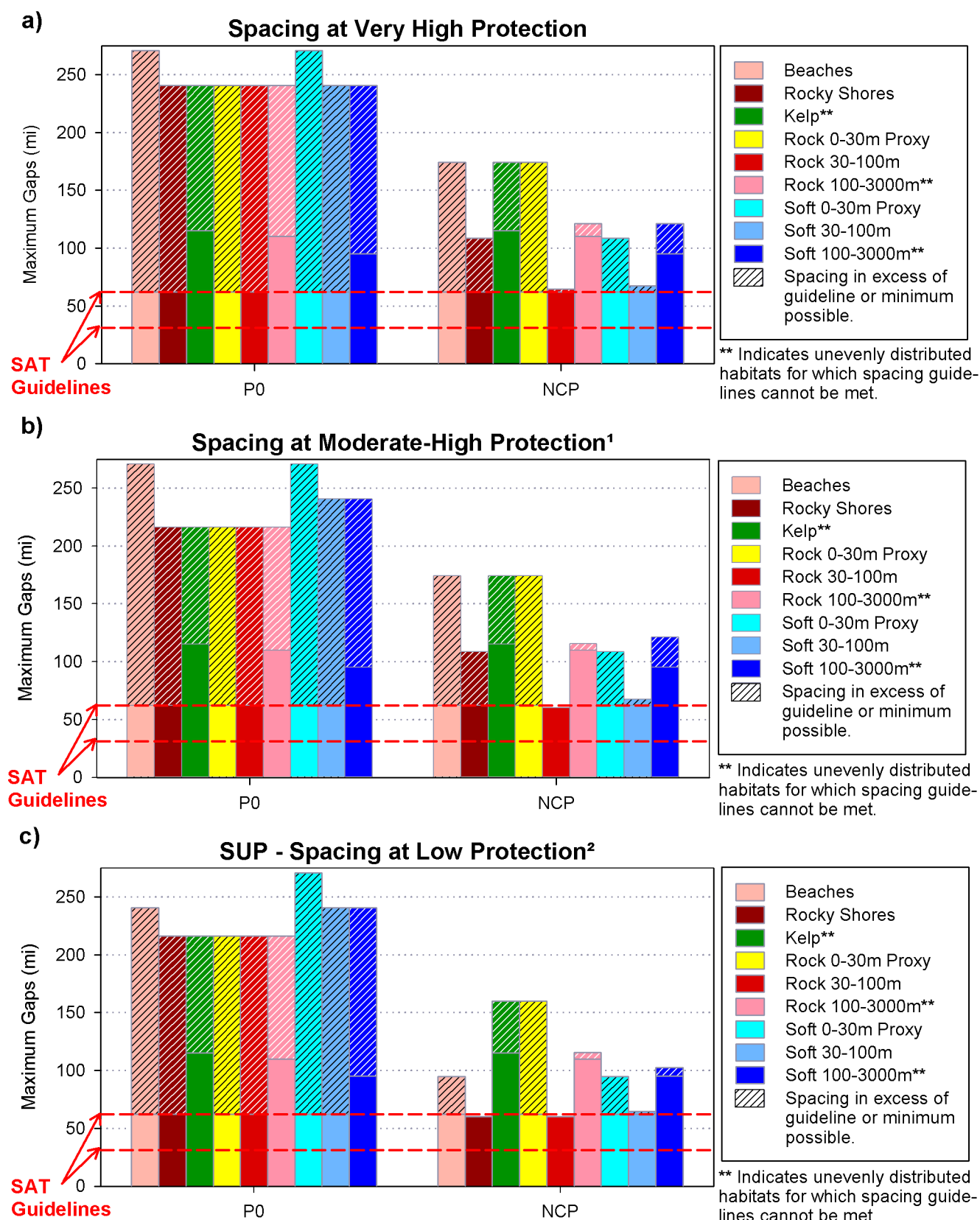
Moderate-High Protection¹	Proposal	
	Proposal 0	NCRSG MPA Proposal
Cluster size in square miles from smallest to largest excluding estuarine MPAs.	2.1	0.4
		9.1
		9.5
		9.6
		9.8
		10.4
		12.0

Low Protection²	Proposal	
	Proposal 0	NCRSG MPA Proposal
Cluster size in square miles from smallest to largest excluding estuarine MPAs.	2.1	0.4
		9.1
		9.5
		9.8
		10.4
		11.5
		13.0
		14.0
		15.5
		18.5
		21.4

¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

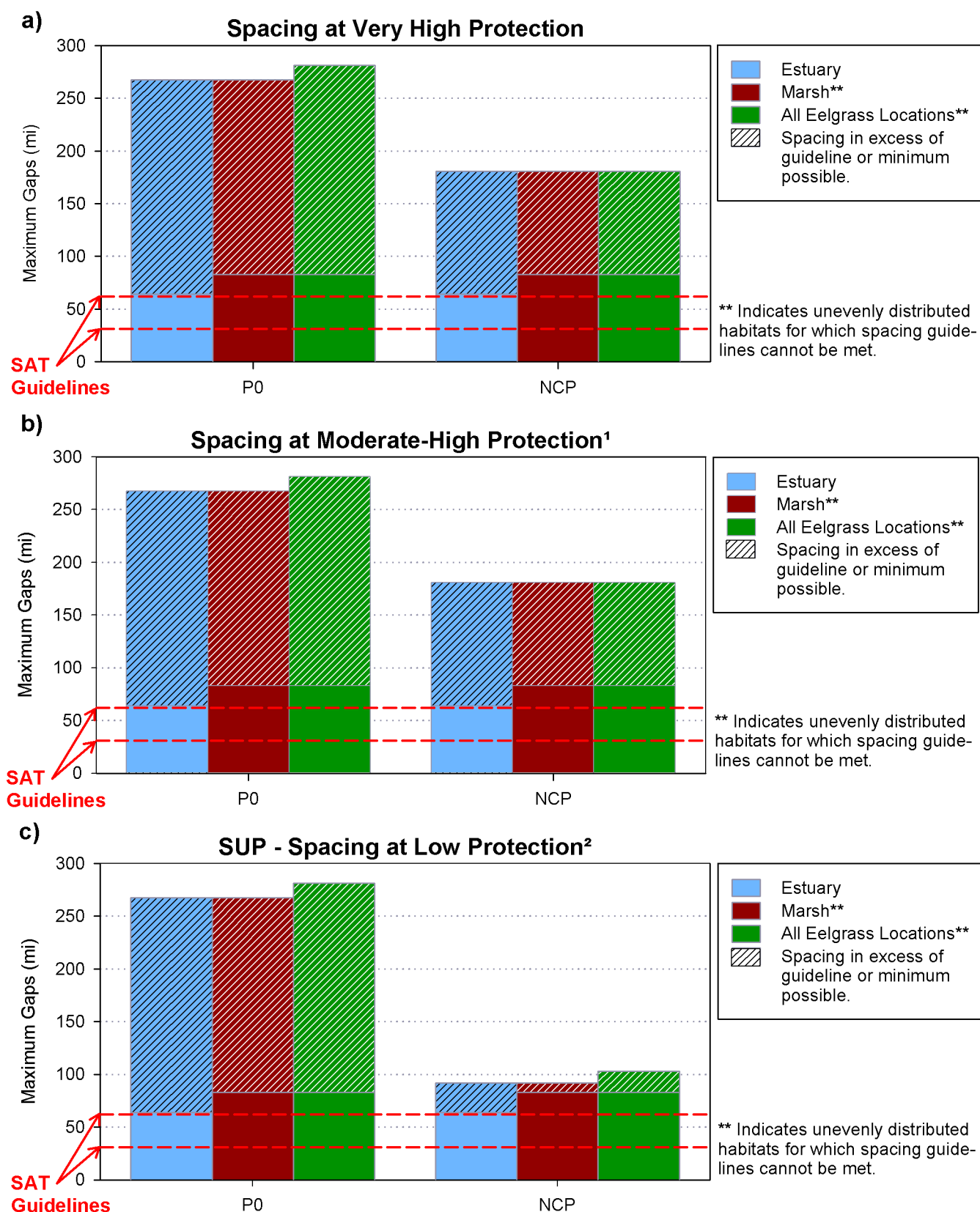
Figure 5.1: Habitat Spacing for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)



¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

Figure 5.2: Estuarine Habitat Spacing for Existing MPAs (P0) and the Round 3 NCRSG MPA Proposal including the Supplemental Evaluation (SUP)



¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.

Table 5.3: Gaps that exceed the SAT spacing guidelines and their locations for Round 3 MLPA North Coast Regional Stakeholder Group MPA Proposal

NCRSG MPA Proposal		Very High Protection					
Habitat	# gaps over guideline	gap #1 (miles)	gap #1 location	gap #2 (miles)	gap #2 location	gap #3 (miles)	gap #3 location
Beaches	2	174	Oregon Border to Ten Mile Cluster	95	Ten Mile Cluster to Bodega Head Cluster		
Rocky Shores	2	109	Oregon Border to South Cape Mendocino SMR	64	Ten Mile Cluster to Stewarts Point Cluster		
Kelp	2	174	Oregon Border to Ten Mile Cluster	64	Ten Mile Cluster to Stewarts Point Cluster		
Rock 0-30m Proxy	2	174	Oregon Border to Ten Mile Cluster	64	Ten Mile Cluster to Stewarts Point Cluster		
Rock 30-100m	1	64	Ten Mile Cluster to Stewarts Point Cluster				
Rock 100-3000m	2	121	Mattole Canyon SMR to Stewarts Point Cluster	116	Oregon Border to Mattole Canyon SMR		
Soft 0-30m Proxy	2	109	Oregon Border to South Cape Mendocino SMR	95	Ten Mile Cluster to Bodega Head Cluster		
Soft 30-100m	2	67	Reading Rock Cluster to Mattole Canyon SMR	64	Ten Mile Cluster to Stewarts Point Cluster		
Soft 100-3000m	2	121	Mattole Canyon SMR to Stewarts Point Cluster	116	Oregon Border to Mattole Canyon SMR		
Estuary	2	181	Chetco River, OR to Ten Mile Estuary SMRMA	89	Ten Mile Estuary SMRMA to Russian River SMRMA		
Marsh	2	181	Chetco River, OR to Ten Mile Estuary SMRMA	89	Ten Mile Estuary SMRMA to Russian River SMRMA		
All Eelgrass Loc.	2	181	Chetco River, OR to Ten Mile Estuary SMRMA	103	Ten Mile Estuary SMRMA to Estero Americano SMRMA		

NCRSG MPA Proposal		Moderate-High Protection ¹					
Habitat	# gaps over guideline	gap #1 (miles)	gap #1 location	gap #2 (miles)	gap #2 location	gap #3 (miles)	gap #3 location
Beaches	2	174	Oregon Border to Ten Mile Cluster	95	Ten Mile Cluster to Bodega Head Cluster		
Rocky Shores	1	109	Oregon Border to South Cape Mendocino SMR				
Kelp	1	174	Oregon Border to Ten Mile Cluster				
Rock 0-30m Proxy	1	174	Oregon Border to Ten Mile Cluster				
Rock 30-100m	0						
Rock 100-3000m	2	116	Oregon Border to Mattole Canyon SMR	97	Mattole Canyon SMR to Point Arena Cluster		
Soft 0-30m Proxy	2	109	Oregon Border to South Cape Mendocino SMR	95	Ten Mile Cluster to Bodega Head Cluster		
Soft 30-100m	2	67	Reading Rock Cluster to Mattole Canyon SMR	64	Ten Mile Cluster to Stewarts Point Cluster		
Soft 100-3000m	2	121	Mattole Canyon SMR to Stewarts Point Cluster	102	Point St. George Reef Offshore SMCA to Mattole Canyon SMR		
Estuary	2	181	Chetco River, OR to Ten Mile Estuary SMRMA	89	Ten Mile Estuary SMRMA to Russian River SMRMA		
Marsh	2	181	Chetco River, OR to Ten Mile Estuary SMRMA	89	Ten Mile Estuary SMRMA to Russian River SMRMA		
All Eelgrass Loc.	2	181	Chetco River, OR to Ten Mile Estuary SMRMA	103	Ten Mile Estuary SMRMA to Estero Americano SMRMA		

NCRSG MPA Proposal		SUP - Low Protection ^{*2}					
Habitat	# gaps over guideline	gap #1 (miles)	gap #1 location	gap #2 (miles)	gap #2 location	gap #3 (miles)	gap #3 location
Beaches	1	95	Ten Mile Cluster to Bodega Head Cluster				
Rocky Shores	0						
Kelp	1	160	Oregon Border to Vizcaino SMCA				
Rock 0-30m Proxy	1	160	Oregon Border to Vizcaino SMCA				
Rock 30-100m	0						
Rock 100-3000m	2	116	Oregon Border to Mattole Canyon SMR	97	Mattole Canyon SMR to Point Arena Cluster		
Soft 0-30m Proxy	1	95	Ten Mile Cluster to Bodega Head Cluster				
Soft 30-100m	1	64	Ten Mile Cluster to Stewarts Point Cluster				
Soft 100-3000m	2	102	Point St. George Reef Offshore SMCA to Mattole Canyon SMR	78	Vizcaino SMCA to Stewarts Point Cluster		
Estuary	3	92	South Humboldt Bay SMRMA to Ten Mile Estuary SMRMA	89	Chetco River, OR to South Humboldt Bay SMRMA	89	Ten Mile Estuary SMRMA to Russian River SMRMA
Marsh	3	92	South Humboldt Bay SMRMA to Ten Mile Estuary SMRMA	89	Chetco River, OR to South Humboldt Bay SMRMA	89	Ten Mile Estuary SMRMA to Russian River SMRMA
All Eelgrass Loc.	3	103	Ten Mile Estuary SMRMA to Estero Americano SMRMA	92	South Humboldt Bay SMRMA to Ten Mile Estuary SMRMA	89	Chetco River, OR to South Humboldt Bay SMRMA

¹ Evaluations at high protection are not shown here because no high protection MPAs were proposed.

² Supplemental evaluations include MPAs at moderate-low and low protection due to recreational take intended to accommodate only tribal uses, plus all MPAs at or above moderate-high protection.